

CLAIMS

1. (Currently Amended) A porous particulate composition comprising a matrix of one or more catalytic components and at least one polymer having a plurality of covalently bound free olefin groups, wherein the catalyst component is an organometallic complex selected from the group consisting of Group 3-10 metals, non-metals, lanthanide metals, actinide metals and combinations thereof; and wherein the matrix is formed by reaction of the one or more catalytic components and the free olefin groups of the polymer.
2. (Currently Amended) The composition of claim 1, wherein the at least one polymer having a plurality of covalently bound free olefin groups is a macroporous polymer prepared in the presence of a porogen and is selected from the group consisting of divinylbenzene polymers, divinylbenzene copolymers, styrene/divinylbenzene copolymers, divinylbenzene resins, cross-linked divinylbenzene polymers, styrene/butadiene copolymers, styrene/isoprene copolymers, vinylsiloxane polymers, [[alkylsiloxane polymers,]] allylsiloxane polymers, [[condensation products of siloxane polymers having a plurality of olefin groups]] and combinations thereof.
3. (Currently Amended) The composition of claim 1, wherein the [[average pore diameter of the polymer having a]] plurality of covalently bound free olefin groups comprise vinyl groups [[is 100 Å or greater and the polymer comprises]] in amounts further comprising at least 0.01 mmol/g residual vinyl [[olefin]] groups.
4. (Currently Amended) The composition of claim 1, wherein the matrix further comprises one or more olefin polymerization catalyst components selected from the group consisting of: Ziegler-Natta catalysts, metallocene complexes of Group 3-10 metals, metallocene complexes of non-metals, metallocene complexes of lanthanide metals, metallocene complexes of actinide metals, single-site catalysts, single-site metallocene catalysts and combinations thereof, and at least one activator component [[and is used for polymerizing at least one olefin monomer selected from the group

consisting of unbranched aliphatic olefins having from 2 to 12 carbon atoms, branched aliphatic olefins having from 4 to 12 carbon atoms, unbranched and branched aliphatic α -olefins having from 2 to 12 carbon atoms, conjugated olefins having 4 to 12 carbon atoms, aromatic olefins having from 8 to 20 carbons, unbranched and branched cycloolefins having 3 to 12 carbon atoms, unbranched and branched acetylenes having 2 to 12 carbon atoms, and combinations thereof]].

5. (Previously Amended) The composition of claim 1, wherein the matrix is selected from the group of formulas consisting of: $[\text{Cp}^1\text{Cp}^2\text{MR}_x\text{L}]^+ [\text{NCA}]^-$, wherein M is a Group 4 metal, Cp^1 is a substituted or non-substituted cyclopentadienyl ring and Cp^2 is the same or different, substituted or non-substituted cyclopentadienyl ring and may be bridged symmetrically or asymmetrically to Cp^1 , R is hydride, alkyl, silyl, germyl or an aryl group, x is an integer equal to 0 or 1, L is formed by reaction of the Group 4 metal complex and the free olefin groups of the polymer and NCA is a non-coordinating anion; $[\text{Cp}^1\text{Cp}^2\text{MR}]^+ [\text{NCA}]^-$, wherein M is a Group 4 metal, Cp^1 is a substituted or non-substituted cyclopentadienyl ring and Cp^2 is the same or different, substituted or non-substituted cyclopentadienyl ring and may be bridged symmetrically or asymmetrically to Cp^1 , R is a hydrocarbonyl group formed by reaction of the Group 4 metal complex and the free olefin groups of the polymer and NCA is a non-coordinating anion; $[\text{Cp}^1\text{MR}_x\text{L}]^+ [\text{NCA}]^-$, wherein M is a Group 4 or 6 metal, Cp^1 is a substituted or non-substituted cyclopentadienyl ring, R is a hydride, alkyl, silyl, germyl or an aryl group, x is an integer ranging from 0 to 6, L is formed by reaction of the Group 4 or 6 metal complex and the free olefin groups of the polymer and NCA is a non-coordinating anion; $[(\text{Multidentate})\text{MR}_x\text{L}]^+ [\text{NCA}]^-$, wherein M is a Group 4 or 6 or 8 or 9 or 10 metal, R is hydride, alkyl, silyl, germyl, aryl, halide or alkoxide group, x is an integer equal to 0, 1 or 2, multidentate is a bidentate, tridentate or tetradentate ligand containing nitrogen, sulfur, phosphorus and/or oxygen as coordinating atoms to the metal, L is formed by reaction of the Group 4 or 6 or 8 or 9 or 10 metal complex and the free olefin groups of the polymer and NCA is a non-coordinating anion; $(\text{Multidentate})\text{MR}_x\text{L}$, wherein M is a Group 4 or 6 or 8 or 9 or 10 metal, R is hydride, alkyl, silyl, germyl, aryl, halide or alkoxide group, x is

an integer equal to 0, 1 or 2, multidentate is a bidentate, tridentate or tetradentate ligand containing nitrogen, sulfur, phosphorus and/or oxygen as coordinating atoms to the metal and L is formed by reaction of the Group 4 or 6 or 8 or 9 or 10 metal complex and the free olefin groups of the polymer; $(Cp^1)_x(Cp^2)_yMR_xL^+[NCA]^-$, wherein M is a lanthanide or an actinide metal, R is hydride, alkyl, silyl, germyl, aryl, halide, alkoxide, amide or solvent ligand, R may also be a bidentate ligand containing nitrogen, sulfur, phosphorus and/or oxygen, $x = 0-2$, $y = 0-2$, L is formed by reaction of the lanthanide or actinide metal complex and the free olefin groups of the polymer and NCA is a non-coordinating anion and combinations thereof.

6. (Currently Amended) The composition of claim 1, wherein the matrix is prepared from one or more polymers having a plurality of covalently bound vinyl groups and having a particle size [[ranging]] from 2 [[5]] nm to 1000 μ m.

7. (Cancelled) An olefin polymerization process that comprises the steps of contacting at least one olefin monomer and a composition comprising a matrix of one or more catalytic components and at least one olefin-based material, wherein the catalyst component is an organometallic complex selected from the group consisting of Group 3-10 metals, non-metals, lanthanide metals, actinide metals and combinations thereof, the olefin-based material further comprising an organic material having a plurality of free olefin groups and wherein the matrix is formed by reaction of the catalytic component and the free olefin groups of the olefin-based material; and polymerizing the olefin monomer to produce a polyolefin.

8. (Cancelled) The process according to claim 7, wherein the olefin monomer is selected from the group consisting of unbranched aliphatic olefins having from 2 to 12 carbon atoms, branched aliphatic olefins having from 4 to 12 carbon atoms, unbranched and branched aliphatic α -olefins having from 2 to 12 carbon atoms, conjugated olefins having 4 to 12 carbon atoms, aromatic olefins having from 8 to 20 carbons, unbranched and branched cycloolefins having 3 to 12 carbon atoms, unbranched and branched

acetylenes having 2 to 12 carbon atoms, and combinations thereof; and wherein the olefin monomer is a polar olefin monomer having from 2 to 12 carbon atoms and at least one atom selected from the group consisting of O, N, B, Al, S, P, Si, F, Cl, Br and combinations thereof.

9. (Cancelled) The process according to claim 7, wherein the olefin monomer is selected from the group consisting of ethylene, propene, 1-butene, 1-hexene, butadiene, styrene, alpha-methylstyrene, cyclopentene, cyclohexene, cyclohexadiene, norbornene, norbornadiene, cyclooctadiene, divinylbenzene, trivinylbenzene, acetylene, diacetylene, alkynylbenzene, dialkynylbenzene, ethylene/1-butene, ethylene/isoprene, ethylene/1-hexene, ethylene/1-octene, ethylene/cyclopentene, ethylene/cyclohexene, ethylene/butadiene, ethylene/hexadiene, ethylene/styrene, ethylene/acetylene, propene/1-butene, propene/styrene, propene/butadiene, propene/1,6-hexadiene, propene/acetylene, ethylene/propene/1-butene, ethylene/propene/1-hexene, ethylene/propene/1-octene, and combinations thereof.

10. (Cancelled) The process according to claim 7, wherein the polymerization is selected from the group consisting of a copolymerization of ethylene and higher α -olefins, a copolymerization of propene and higher α -olefins, and a copolymerization of styrene and higher α -olefins.

11. (Cancelled) The process according to claim 7, wherein the polyolefin produced is selected from the group consisting of HDPE, LDPE, LLDPE, polyolefins incorporating a plurality of olefin monomers, polyolefins incorporating α -olefins, copolymers of ethylene and α -olefins selected from the group consisting of 1-butene, 1-hexene and 1-octene, stereospecific polyolefins, stereoregular polyolefins, and polyolefins having stereospecific structures selected from the group consisting of atactic, isotactic, syndiotactic, hemi-isotactic and stereoregular blocks and combinations thereof.

12. (Cancelled) The process according to claim 7, wherein a polyolefin particle essentially retains the shape of a prepared matrix particle.

13. (Cancelled) The process according to claim 7, wherein the catalytic component is selected from the group consisting of olefin polymerization catalysts, Ziegler-Natta catalysts, metallocene complexes of Group 3-10 metals, metallocene complexes of non-metals, metallocene complexes of lanthanide metals, metallocene complexes of actinide metals, single-site catalysts, single site metallocene catalyst and combinations thereof; wherein the matrix further comprises a plurality of catalytic components and at least one activator component; and wherein the matrix is represented by a formula $[\text{Cp}^1\text{Cp}^2\text{MR}_x\text{L}]^+ [\text{NCA}]^-$, wherein M is a Group 4 metal, Cp^1 is a substituted or non-substituted cyclopentadienyl ring and Cp^2 is the same or different, substituted or non-substituted cyclopentadienyl ring and may be bridged symmetrically or asymmetrically to Cp^1 , R is hydride, alkyl, silyl, germyl or an aryl group, x is an integer equal to 0 or 1, L is an olefin-based material and NCA is a non-coordinating anion; or the matrix is represented by a formula $[\text{Cp}^1\text{Cp}^2\text{MR}]^+ [\text{NCA}]^-$, wherein M is a Group 4 metal, Cp^1 is a substituted or non-substituted cyclopentadienyl ring and Cp^2 is the same or different, substituted or non-substituted cyclopentadienyl ring and may be bridged symmetrically or asymmetrically to Cp^1 , R is a hydrocarbyl group derived from the hydrozirconation of an olefin-based material and NCA is a non-coordinating anion; or the matrix is represented by a formula $[\text{Cp}^1\text{MR}_x\text{L}]^+ [\text{NCA}]^-$, wherein M is a Group 4 or 6 metal, Cp^1 is a substituted or non-substituted cyclopentadienyl ring, R is a hydride, alkyl, silyl, germyl or an aryl group, x is an integer ranging from 0 to 6, L is an olefin-based material and NCA is a non-coordinating anion; or the matrix is represented by a formula $[(\text{Multidentate})\text{MR}_x\text{L}]^+ [\text{NCA}]^-$, wherein M is a Group 4 or 6 or 8 or 9 or 10 metal, R is hydride, alkyl, silyl, germyl, aryl, halide or alkoxide group, x is an integer equal to 0, 1 or 2, multidentate is a bidentate, tridentate or tetradentate ligand containing nitrogen, sulfur, phosphorus and/or oxygen as coordinating atoms to the metal, L is an olefin-based material and NCA is a non-coordinating anion; or the matrix is represented by a formula $(\text{Multidentate})\text{MR}_x\text{L}$, wherein M is a Group 4 or 6 or 8 or 9 or 10 metal, R is hydride,

alkyl, silyl, germyl, aryl, halide or alkoxide group, x is an integer equal to 0, 1 or 2, multidentate is a bidentate, tridentate or tetradentate ligand containing nitrogen, sulfur, phosphorus and/or oxygen as coordinating atoms to the metal and L is an olefin-based material; or the matrix is represented by a formula $(Cp^1)_x(Cp^2)_yMR_xL+[NCA]$, wherein M is a lanthanide or an actinide metal, R is hydride, alkyl, silyl, germyl, aryl, halide, alkoxide, amide or solvent ligand, R may also be a bidentate ligand containing nitrogen, sulfur, phosphorus and/or oxygen, $x = 0-2$, $y = 0-2$, L is an olefin-based material and NCA is a non-coordinating anion.

14. (Cancelled) The process according to claim 7, wherein the polyolefin is prepared in a reactor system selected from the group consisting of gas phase reactors, slurry phase reactors and solution phase reactors and combinations thereof.
15. (Cancelled) A coating process comprising depositing the matrix of claim 1 on a substrate and polymerizing olefin monomer to produce a polyolefin coated surface, object or particulate.
16. (Cancelled) The process according to claim 15, wherein the substrate is selected from the group consisting of clays, micas, silicates, metals, polymer particles, non-metal oxides, organometallic oxides and inorganic oxides.
17. (Cancelled) A process for preparing a composite of substrate and polyolefin in-situ using the matrix of claim 1 in combination with at least one substrate.
18. (Cancelled) The process according to claim 17, wherein the substrate is selected from the group consisting of clays, micas, silicates, metals, polymer particles, non-metal oxides, organometallic oxides and inorganic oxides.
19. (Cancelled) The process according to claim 17, wherein polyolefin properties are modified.

20. (Cancelled) A process for the production of hydrophobically modified particles in the form of spheres, surfaces and objects in which the catalytic matrix is disposed on the surfaces thereof.
21. (Previously added) A porous particulate composition comprising a matrix of at least one macroporous polymer having a plurality of free olefin groups selected from the group consisting of: divinylbenzene polymers, divinylbenzene copolymers, styrene/divinylbenzene copolymers, divinylbenzene resins, cross-linked divinylbenzene polymers, styrene/butadiene copolymers, styrene/isoprene copolymers, vinylsiloxane polymers, allylsiloxane polymers and combinations thereof; and at least one Ziegler-Natta catalyst, wherein the matrix is formed by reaction of the at least one Ziegler-Natta catalyst and the free olefin groups of the polymer.
22. (Previously added) The porous particulate composition according to claim 21, wherein the Ziegler-Natta catalyst comprises at least one titanium compound, at least one magnesium compound and at least one aluminum compound.
23. (Previously added) A porous particulate composition comprising a matrix of at least one macroporous polymer having a plurality of free olefin groups selected from the group consisting of: divinylbenzene polymers, divinylbenzene copolymers, styrene/divinylbenzene copolymers, divinylbenzene resins, cross-linked divinylbenzene polymers, styrene/butadiene copolymers, styrene/isoprene copolymers, vinylsiloxane polymers, allylsiloxane polymers, and combinations thereof; and at least one catalyst further comprising at least one chromium compound and at least one silicon compound, wherein the matrix is formed by reaction of the at least one catalyst and the free olefin groups of the polymer.